May 23, 1867.

Lieut.-General SABINE, President, in the Chair.

The following communications were read:—

I. "On the Intimate Structure of the Brain."—Second Series. By J. LOCKHART CLARKE, Esq., F.R.S. Received May 1, 1867.

(Abstract.)

Abstracts of a considerable portion of this paper have been already published in the Proceedings of the Royal Society for June 18, 1857, and June 20, 1861, under the title of "Notes of Researches on the Intimate Structure of the Brain."

After adding several new facts, and giving further explanations on the subject of the *medulla oblongata*, the author gives a full description of the morphological changes by which the auditory and other centres are developed out of elements of the spinal cord. The auditory centres consist of an outer and an inner nucleus. The outer nucleus is developed from the grey substance of the posterior pyramid and restiform body of the medulla. The inner nucleus arises between the posterior pyramid and the nucleus of the eighth cerebral nerve. From both these nuclei the *posterior* division of the auditory nerve takes its origin. The *anterior* division consists of two portions. The principal portion penetrates the medulla beneath the restiform body, and running along the outer side of the caput cornu, or grey tubercle, enters both the outer and inner nucleus. The other portion of the nerve runs backward along the upper border of the restiform body, which it accompanies over the superior peduncle of the cerebellum to the inferior vermiform process. The outer auditory nucleus, consisting of the grey substance of the posterior pyramid and restiform body, is ultimately thrown backward into the cerebellum, part of it arching over the fourth ventricle to the opposite side, while the rest extends outward to the corpus dentatum of the cerebellum.

It would not be possible to give an abstract of the numerous details of structure and the complicated connexions of different parts described in the paper. The following facts, however, may be mentioned.

The roots of the facial nerve are shown to have a very remarkable course and very complicated connexions with surrounding parts. On reaching the *fasciculus teres* they bend downward in the form of a loop, the lower arm of which is connected with the motor nucleus of the trigeminus and with the upper olivary body, as well as with their own special nuclei. The longitudinal portion of this loop forms the column which Stilling mistook for what he calls the "constant root of the trigeminus," and which Schroeder van der Kolk mistook for one of the striæ

medullares. The upper olivary bodies (which were first pointed out by the author in 1857, and subsequently described by Schroeder van der Kolk) and the trapezium are further investigated in a comparison between those of man, the orang outang, and different orders of mammals. The structure of the entire medulla oblongata in the monkey is likewise compared with that of man. The paper concludes with the physiological and pathological application of its contents.

II. "On Pyrophosphoric Acid with the Pyro- and Tetra-phosphoric Amides." By J. H. Gladstone, Ph.D., F.R.S. Received May 9, 1867.

From time to time I have communicated to the Chemical Society descriptions of certain bodies which are best viewed as amides of pyrophosphoric acid; and in pursuing the inquiry I have recently obtained some fresh results, and a new class of compounds. I propose continuing to send the details to the Chemical Society, but I may be permitted to submit to the Royal Society a condensed account of the main facts arrived at in the whole investigation, and a theory of the formation of these substances.

Pyrophosphoric acid is, in the notation now generally adopted, $P_2H_4O_7$. In an examination of its ferric compounds, I found evidence of the existence, in solution, of the double salt $P_2Na_2fe_2O_7$*. A more remarkable fact is that the complete ferric salt, and several other pyrophosphates, can exist in an allotropic condition. Thus pure $P_2fe_4O_7$, prepared by double decomposition, dissolves readily in dilute sulphuric acid; but on heating the solution it separates in a form which is almost insoluble in the acid. When these allotropic salts are decomposed, the acid produced appears to have the ordinary properties. It is a *pyrophosphate* which is formed, when oxychloride of phosphorus is attacked by a strong aqueous solution of an alkali.

Pyrophosphoric acid exhibits a great tendency to form acid amides. It is only necessary to neutralize it with ammonia to get a body which, when treated with a metallic salt not in excess, gives more or less of a *pyrophosphamate* of the metal, thus:—

$$P_2H_4O_7+4NH_3+3fe\,Cl=P_2(NH_2)fe_3O_6+H_2O+3NH_4Cl.$$

Pyrophosphamic acid, $P_2(NH_2)H_3O_6$, may be also prepared by breaking down the higher amides. It is similar in most of its properties to pyrophosphoric acid, but is tribasic. Its ferric salt has also an allotropic modification; when heated with an acid it becomes far less soluble in sulphuric acid, ferric chloride, or pyrophosphate of sodium.

Pyrophospho-diamic acid, $P_2(NH_2)_2H_2O_5$, is produced in a variety of

* In order to avoid great complexity of formulæ, Williamson's *Ferricum*, fe=18·66, has been adopted.